ROBOT DEVICE

TECHNICAL FIELD

The present invention relates to a device, use and method to eliminate the risk of play in a three-axle joint in a robot.

PRIOR ART

In a delta robot, a positioning of a moveable element in relation to a fixed element takes place (Fig. 5). Three driving means each drive their own link device arranged between the fixed and the moveable elements. The link devices can include rods arranged in multi-joint systems where the joints can comprise ball and socket joints.

The American document US,A, 4 976 582 shows, among other things, a delta robot with two parallel links 5a and 5b joined to pivot with ball and socket joints 26a, 26b, 27a, and 27b (Fig. 5). The joint sockets are attached to the ends of the links.

The ball and socket joints according to the invention are designed with replaceable bearing means that minimise friction in the joints. The bearing means has a socket-shaped inner surface and is manufactured in self-lubricating polymer material. The bearing means is arranged in a seat in the joint socket. During the operation of the robot, rotational movements take place in the ball and socket joints and directional movements also occur.

Problems arise when the bearing means follows the rotational movement, i.e. follows the rotation movement of the ball of the joint. In this situation, link movements take place at the same radii take place at the joint socket at each stroke of the linkage device, whereby wear occurs repeatedly at the same location. An uneven wear occurs in the joint, which causes play in the joint and thus increased friction in the joint. The reason that the bearing

means rotates with the ball joint is that the material in the bearing means is too soft to ensure a good tight fit in the seat.

A robot including a joint / joints with play does not work at a smooth pace but is disturbed in its movement as the joints bind and the movements become imprecise. The balance of moments in the construction is disturbed, which drastically reduces the working life of the robot. The cycle time increases and the robot cannot meet its performance requirements.

In the operation of robots, the need thus arises to firmly fix a bearing means in a seat in a joint socket. This need cannot be met by the delta robot in the American document.

SUMMARY OF THE INVENTION

When designing delta robots, the objective according to the invention is to achieve a design with a low weight that can handle a stroke time of 0.5 seconds. To achieve robots that are this fast, the joint must be designed so that friction is minimised.

A certain wear on the bearing means in a joint is unavoidable. An even wear of a self-lubricating bearing means gives an even lubrication of and a smooth movement in the joint. When the wear is even, no unwanted play occurs and the robot has a smooth, rapid operation.

The object of the present invention is thus to achieve a robot including a means with which one increases the friction between bearing means and socket in a ball and socket joint. An additional object of the invention is to design the device so that it allows an easy replacement of bearing means according to need.

DESCRIPTION OF THE DRAWING

The invention will be explained in greater detail by describing an example of an embodiment with reference to the enclosed drawings, where;

Fig. 1 shows a socket of a joint according to the invention,

Fig. 2 shows a joint socket according to the invention,

Fig. 3 shows a joint socket according to the invention arranged with grooves,

Fig. 4 shows an alternative design with a socket-shaped seat and bearing means,

Fig. 5 shows a delta robot.

DESCRIPTION OF EMBODIMENTS

A three-axle ball and socket joint in a robot (Fig. 5) comprises a joint socket and a joint ball. The joint socket 1 encloses the ball of the joint (not shown) with a space that comprises approximately a half of a sphere or less (Fig. 1). A housing 2 shaped to accommodate a bearing means 3 is located within socket 1.
The word bearing here relates to either one annular bearing, several annular bearings or the bearing divided into sections in a way suitable for the purpose. In the embodiment described below, the bearing means comprises one annular bearing means.

The housing 2 includes a surface 4 against which the annular bearing means 3 is pressed to fit tightly (Fig. 2). Annular bearing means 3 is manufactured from a polymer material and is pressed to fit tightly in place with the aid of a tool in the traditional manner. To increase the friction between surface 4 of the joint socket and the annular bearing means 3, friction-increasing means 5 are arranged on the surface 4. The friction-increasing means can be designed as, for example, a wave structure in the form of grooves 5´ (Fig. 3). The orientation of the grooves 5´ in a longitudinal direction forms the angle (α) with the centre axis (A) of the annular bearing means. Grooves 5´ are preferably parallel with the centre axis (A). In addition, the grooves should have sharply pointed tops to secure the friction. When the annular bearing means 3 is arranged in the housing 2, the friction-increasing

means 5 achieve a permanent deformation of the annular bearing means 3 by penetrating its material.

An alternative design of the invention is to make the envelope surface of the bearing means compatible to the friction-increasing means 5 arranged on the surface of the joint socket 4. In the embodiment described above with the friction-increasing means 5 in the form of grooves 5´, the bearing means 3 can thus be alternatively designed with grooves that are compatible with the surface of the housing.

A further alternative design of the invention is to design the housing of the joint socket socket-shaped and provided with grooves. Then the bearing means is designed with a socket-shaped outer surface and is placed without being pressed to fit tightly in the housing of the joint socket. In this design of the invention, it is the spring force that holds the ball and socket joint together that also fixes the bearing means firmly in place.
